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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/017,829	12/07/2001	Peter J. Ortoleva	211994	6736

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EXAMINER

PROCTOR, JASON SCOTT

ART UNIT	PAPER NUMBER
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2123

DATE MAILED: 09/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/017,829

Applicant(s)

ORTOLEVA, PETER J.

Examiner

Jason Proctor

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 February 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-49 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-49 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claims 1-49 have been presented for examination. Claims 1-49 have been rejected.

Specification

1. The disclosure is objected to because it contains an embedded hyperlink and/or other form of browser-executable code. Applicant is required to delete the embedded hyperlink and/or other form of browser-executable code. See MPEP § 608.01. The table at page 57 contains several "web addresses" which should be deleted.

Drawings

2. The drawings are objected to for the reasons indicated on attached Notice of Draftspersons Patent Drawing Review, form PTO-948.

Duty to Disclose

3. Applicants are respectfully reminded of the duty to disclose information under 37 CFR 1.56. During the prior art search for this application, numerous publications by the inventor have come to light. Normally the Examiner would require the most relevant publications under 37 CFR 1.105, however the enormous scope of the current invention and the volume of published material makes this course of action inexpedient. The Examiner is unable to make a specific request for pertinent information. Applicants are requested to review that material which is known to the individuals identified in 37 CFR 1.56 and to submit those materials which may be

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relevant to the patentability of the claimed invention. The absence of an Information Disclosure Statement in this application at the time of this Office Action has been noted.

Claim Rejections - 35 USC § 101

35 U.S.C. § 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 1-49 are rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter. MPEP 2106 (IV)(B)(1) reads as follows:

Abstract ideas, *Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759, or the mere manipulation of abstract ideas, *Schrader*, 22 F.3d at 292-93, 30 USPQ2d at 1457-58, are not patentable.

[...]

In practical terms, claims define nonstatutory processes if they:

- consist solely of mathematical operations without some claimed practical application (i.e., executing a “mathematical algorithm”); or
- simply manipulate abstract ideas, e.g., a bid (*Schrader*, 22 F.3d at 293-94, 30 USPQ2d at 145859) or a bubble hierarchy (*Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759), without some claimed practical application.

Claims 1, 21, and 37 consist entirely of mathematical operations and are therefore inappropriate subject matter for patent protection. Dependent claims 2-20, 22-36, and 38-43 stand rejected by virtue of their dependence.

5. Claims 1, 21, 37, 44, and 47 are rejected for claiming non-statutory processes. MPEP 2106 (II)(A) reads as follows:

The claimed invention as a whole must accomplish a practical application. That is, it must produce a “useful, concrete and tangible result.” *State Street*, 149 F.3d at 1373, 47 USPQ2d at 1601-02.

[...]

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A process that consists solely of the manipulation of an abstract idea is not concrete or tangible. See *In re Warmerdam*, 33 F.3d 1354, 1360, 31 USPQ2d 1754, 1759 (Fed. Cir. 1994). See also *Schrader*, 22 F.3d at 295, 30 USPQ2d at 1459.

None of the claims presented in this application define a statutory method that produces a useful, concrete, and tangible result. Of the independent claims, claim 44 comes closest to reciting a practical application (producing a model of fracture locations and fracture characteristics in a geologic basin), however the method fails to produce a concrete or tangible result. Steps such as “comparing” or “processing [...] by applying equations” are mathematical manipulations. Regardless of the recited steps, the resulting “model of fracture locations and fracture characteristics” is intangible numerical data. The dependent claims stand rejected by virtue of their dependence.

6. Claim 47 is rejected for claiming an abstract concept. MPEP 2106 (IV)(B)(1) reads as follows:

If the “acts” of a claimed process manipulate only numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. *Schrader*, 22 F.3d at 294-95, 30 USPQ2d at 1458-59. Thus, a process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter and thus cannot constitute a statutory process.

Claim 47 is directed toward a method that is defined primarily by a step of “processing a subset of data points” by applying equations selected from a list of scientific disciplines. This type of recitation illustrates that the metes and bounds of the claim are directed toward an abstract concept of data processing or applying equations. Claims 48-49 stand rejected by virtue of their dependence.

MPEP 2106 (II) states:

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Whenever practicable, Office personnel should indicate how rejections may be overcome and how problems may be resolved.

In this instance, the Examiner is unable to make such an indication because the nature of the invention precludes a simple solution. The methods currently defined by the claims are purely mathematical. To illustrate the purely mathematical nature of the invention, Applicants' attention is drawn to the specification, paragraph 0220:

The two above-described embodiments illustrate the broad applicability of the invention, spanning as they do a range of time coordinates from nanoseconds to geologic eons and a range of space coordinates from the atomic to the continental. In view of the many possible embodiments to which the principles of this invention may be applied, it should be recognized that these embodiments are meant to be illustrative only and should not be taken as limiting the scope of the invention. Therefore, the invention as described herein contemplates all such embodiments as may come within the scope of the following claims and equivalents thereof.

The specification describes an abstract mathematical concept rather than a practical application of invention that employs the mathematical concept. Therefore, the Examiner cannot suggest how to overcome these rejections while maintaining the spirit and scope of invention.

To expedite a complete examination of the instant application the claims rejected under 35 U.S.C. § 101 (nonstatutory) above are further rejected as set forth below in anticipation of applicant amending these claims to place them within the four statutory categories of invention.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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7: Claims 1-49 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Due to a preponderance of difficulties under 35 U.S.C. § 112, second paragraph, the Examiner provides the following comprehensive yet exemplary rejections to assist Applicants' in identifying the indefiniteness of the entire claim language.

Claim 1 recites a method for producing a model of a region of interest that is indefinite.

Claim 1 recites a step of "dividing the first data set into a second data set and a third data set" but specifies no additional details of the step of dividing. As a method of mathematical operations, the method is undefined when either the second data set or third data set is an empty set. Elements of both the second and third data set are required for later steps, therefore it is unclear if these later steps are optional. A more practical example of the indefiniteness is whether "dividing" means a partition of the first data set, a copy of the first data set, or some other means of producing the second data set and third data set.

Claim 1 recites a step of "populating a model with data points from the second data set" which is open to several distinct interpretations. If the "model" is an array of data, it is unclear how the model would be different from the second data set. In the context of a mathematical construct, the Examiner observes that a matrix is functionally equivalent to an array. Because it is unclear what form the model takes or how to populate the model, it is unknown how to conduct a proper search of the prior art. Does populating the model require that all data points

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be transferred to the model? Is populating a model with one data point sufficient to teach this limitation? Is an array of data sufficient to teach “a populated model”?

Claim 1 further recites a step of comparing a subset of data points in the model to a subset of data points in the third data set. Again, this step is indefinite and it is subsequently unclear what should be found in the prior art in order to teach this limitation. It is unclear if this step is optional where the third data set is the empty set. The nature of the comparison is not specified.

The claim concludes with a step to be performed “if comparing yields a discrepancy larger than an error limit”. The claim does not recite a step to be performed if the discrepancy is smaller than an error limit. The error limit is not explained. In light of the previously recited steps, it is unclear from where the error originates. The “error limit” appears to be arbitrary, which is not necessarily indefinite, but the surrounding ambiguity makes it impossible to determine what would teach this limitation in the prior art.

Further, in a situation where the third data set is the empty set, the method appears to consist of the steps of collecting, dividing, populating, and interpolating. In a situation where the second data set is the empty set, the method appears to consist of the steps of collecting and dividing. In a situation where neither the second nor third data sets are empty sets, the method appears to omit the step of “varying a data point” based on the seemingly arbitrary error limit, in which case the method consists primarily of collecting, dividing, and interpolating. The Examiner respectfully submits that none of these scenarios appear to concisely define what Applicants’ have disclosed as the invention.

Claim 21 is difficult to interpret to determine compliance with 35 U.S.C. § 112 primarily because of the non-statutory subject matter defined by the claim.

The phrase “extending a model of a region of interest along a coordinate” is indefinite because a coordinate is generally interpreted as a single point. Alternate definitions are not known in the art. It is unclear what is meant by extending something along a point. The Examiner respectfully submits that the term “coordinate” potentially should be replaced by “axis”, “continuum”, or some other two-dimensional abstraction.

Claim 21 recites “applying an equation to evolve the model a distance along the coordinate” which is further indefinite. While Applicants’ may act as their own lexicographer, the Examiner respectfully requests explicit clarification regarding this use of the term “evolve”, which apparently diverges from the well-known definition. Again, it is unclear what is meant by “evolving the model a distance along the coordinate” for the reasons set forth above, and further because it is unclear whether “evolve” is synonymous with “extend”.

Claim 21 also recites “maximizing a probable state of the evolved model” the meaning of which, in the context of the claim, is entirely unknown. There is no previous mention of “a probable state” of the model, evolved or otherwise. It is unclear whether “maximizing” that probable state means assigning a higher probability or if it involves a more complicated process. Further, if “evolve” is synonymous with “extend”, as suggested by the previous limitation, it is unclear how this limitation further defines a method of extending a model as recited in the preamble.

Claim 37 recites a method of estimating a probability of a model that is indefinite.

It is unclear what is meant by “a probability of a model”. As understood by the Examiner, a probability is the likelihood that an event occurs and is often expressed as a numerical value between zero and one, inclusive. It is therefore unknown what is meant by “a probability of a model”. The best interpretation the Examiner can offer for claim 37 is “a method for estimating a probability of correctness of a model”, however this interpretation is speculative and significantly changes the scope of the claim.

Claim 37 recites a step of comparing that does not appear related to the surrounding method. The result of the comparison is not used elsewhere in the claim and does not appear to contribute to the stated purpose of the method. It is unclear if this step is optional, and if so, how to grant patentable weight to such a limitation.

Claim 37 recites the phrase “calculating a probability functional”, the meaning of which is unknown. Again, Applicants may act as their own lexicographer, however the Examiner respectfully requests explicit definitions of the terminology in the claims. The phrase “probability functional” is interpreted as “probability function”.

Claims 44 and 47 recite practical applications for the method of claim 1 and share many of the deficiencies of claim 1. The step of dividing is particularly problematic for the reasons set forth above. It is unclear whether the subsequent steps are optional or required. It is unclear what must be shown in the prior art to teach this claimed method.

Claim 48 is further indefinite for reciting combinations of limitations that must be interpreted as, for example, collecting data in the set of x-ray crystallography and processing the data using equations of membrane transport. The meaning of these limitations is entirely

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unclear. However, if they were explicitly recited they would be subject to rejection under 35 U.S.C. § 101 as lacking utility.

Claims rejected but not specifically mentioned stand rejected by virtue of their dependence. The rejections enumerated above are to be regarded as exemplary of the state of the dependent claims.

In summary, broad claims are not necessarily indefinite, however these claims are both broad and indefinite. The Examiner respectfully suggests that Applicants' carefully consider the breadth claim language in their response. MPEP 2111 reads as follows:

During patent examination, the pending claims must be "given their broadest reasonable interpretation consistent with the specification." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). Applicant always has the opportunity to amend the claims during prosecution, and broad interpretation by the examiner reduces the possibility that the claim, once issued, will be interpreted more broadly than is justified. *In re Prater*, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-51 (CCPA 1969)

MPEP 2111.01 reads as follows:

While the claims of issued patents are interpreted in light of the specification, prosecution history, prior art and other claims, this is not the mode of claim interpretation to be applied during examination. During examination, the claims must be interpreted as broadly as their terms reasonably allow. *In re American Academy of Science Tech Center*, F.3d, 2004 WL 1067528 (Fed. Cir. May 13, 2004)

Because of this clear instruction to interpret the claims broadly, situations such as those noted above regarding empty sets and optional steps must be positively addressed during patent prosecution. Applicants' may find it expedient to draft the claims in such a way that these problematic interpretations are impossible.

Claim Interpretation

The numerous rejections under 35 U.S.C. §§ 101 and 112 make it impossible for the Examiner to adequately determine the scope of the claimed invention without relying on speculative assumption. Therefore, applying prior art to the claims would not further prosecution at this time. See *In re Steele*, 305 F.2d 859, 134 USPQ 292 (CCPA 1962); *Ex parte Brummer*, 12 USPQ 2d, page 1654; and also *In re Wilson*, 424 F.2d 1382, 165 USPQ 494 (CCPA 1970).

Instead, the Examiner has briefly summarized what may be relevant prior art and respectfully invites Applicants to identify how the claimed invention may be patentable over these references. Applicants are reminded that they must consider all cited art per 37 CFR 111(c) when amending the claims to conform with 35 U.S.C. § 112.

US Patent No. 5,905,657 to Celniker discloses a method and system for interpretation of geological data. The method comprises acquiring data as well as using simulation to produce synthetic data. Applicants' attention is particularly drawn to Celniker's method of improving acquired data through simulation (column 4, lines 16-37; etc.)

US Patent No. 6,820,074 to Simpson discloses a method for interpolating data in a two dimensional grid data, such as geologic horizon data inferred from seismic information (column 2, lines 10-24; etc.)

US Patent No. 6,907,392 to Bennis et al. discloses a method of generating a hybrid grid for modeling an underground formation where wells have been drilled. The interior of the grid

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data is populated by transfinite interpolation. Relaxation techniques are then used to "harmonize and regulate" the grid (column 4, lines 21-39; etc.)

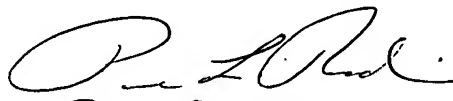
Conclusion

Art considered pertinent by the examiner but not applied has been cited on form PTO-892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Proctor whose telephone number is (571) 272-3713. The examiner can normally be reached on 8:30 am-4:30 pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached at (571) 272-3749. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Jason Proctor Paul L. Rodriguez 9/13/05
Primary Examiner
Art Unit 2125